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MILLER, RYAN J	

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17

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/504,022	Applicant(s) SZELISKI ET AL.	
	Examiner Ryan J. Miller	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 February 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12*.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *16* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 16, 2004 has been entered.

Response to Arguments

2. Applicant's arguments filed October 17, 2003 have been fully considered. A response to these arguments is provided below.

35 U.S.C. 112, First and Second Paragraph Rejections

Summary of Argument: Regarding the 35 U.S.C. 112, first paragraph rejection, the applicant addresses each of the issues raised by the examiner in the May 16, 2003 office action (see applicant's remarks: pages 26-40). Regarding the 35 U.S.C. 112, second paragraph rejections, the applicant argues that the substitute specification provides clear and descriptive support for the claimed invention (see applicant's remarks: page 41).

Examiner's Response: Based on the substitute specification, the claims are clearly supported and enabled. Therefore, the examiner has withdrawn the 35 U.S.C. 112, first and second paragraph rejections. However, the examiner disagrees with the applicant's assertion that the substitute specification contains no new matter. This issue will be addressed below in an objection to the specification.

Prior Art Rejections

35 U.S.C. 102(b) rejections

Summary of Argument: With regard to claims 1-3, 9-17, and 19, which have been rejected under 35 U.S.C. 102(b) as being anticipated by Neff et al. (U.S. Patent No. 5,809,171 A), the applicant argues that Neff et al. fails to disclose all of the components of the applicants claimed invention. For instance, Neff et al. fails to disclose a conventional graphics card that has been modified to include a statistics comparison device. Neff et al. also fails to disclose any sort of pixel acceptance test or a statistics enable switch (see applicant's remarks: pages 42-44). With regard to claims 1-5, which have been rejected under 35 U.S.C. 102(b) as being anticipated by Sacks et al. (U.S. Patent No. 4,736,437 A), the applicant argues that Sacks et al. fails to disclose all of the components of the applicants claimed invention. For instance, Sacks et al. fails to disclose a conventional graphics card that has been modified to include a statistics comparison device. Sacks et al. also fails to disclose any sort of pixel acceptance test or a statistics enable switch (see applicant's remarks: pages 45-46). With regard to claims 6-8, which have been rejected under 35 U.S.C. 102(b) as being anticipated by Sacks et al., the applicant argues that Sacks et al. fails to disclose that the pattern recognizer described in the reference is capable of performing the claimed rendering model transformations (see applicant's remarks: page 47).

Examiner's Response: Applicant's arguments with respect to claims 1-3, 9-17, and 19, which were previously rejected under 35 U.S.C. 102(b) as being anticipated by Neff et al., and with respect to claims 1-5, which were previously rejected under 35 U.S.C. 102(b) as being anticipated by Sacks et al., have been considered but are moot in view of

the new ground(s) of rejection presented below. Regarding claims 6-8, the examiner disagrees with the applicant's arguments. As described in the final rejection mailed on May 16, 2003, Sacks et al. describes that an angle rotator initially rotates the scanning line of the information stored in the reference memory 16 (i.e. rendering model transformations). The applicant's specification describes that the graphics rendering device is equivalent to a graphics rasterizer (see applicant's specification; page 4, line 25). Therefore, this limitation is met by the angle rotator of Sacks et al. as described above.

Specification

3. The substitute specification filed October 17, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

A) At page 13, lines 11-15, the substitute specification states, "during a raster transformation of the first and second sets of digital data, multiple images of the digital data are placed in texture memory as multiple textures. Then, statistics are gathered concerning the textures, and the raster transformed sets of digital data are compared and matched against portions of each other." Nowhere in the applicant's originally filed disclosure does the reference describe a raster transformation to obtain texture values. The originally filed specification describes that the raster transformation is a geometric transform such as an incremental rotation or skew (see original specification: page 8, line 10). Furthermore, the original specification did not describe or suggest that the system

gathered statistics concerning texture. This feature was also added to the specification at page 5, lines 13-23 of the substitute specification.

B) At page 13, lines 26-29, the substitute specification states that "as the data is passed through the rasterization pipeline of the graphics processor, statistics between the textures are gathered and processed via the statistical comparison processor". However, the originally filed specification never describes that the statistical comparison processor gathers statistics between texture values. On page 12, lines 1-14, the original description describes that the statistics accumulated by the statistics comparison processor are a cross-correlation coefficient, the sums of pixel values, the sum of the product of pixel values, the sums of the squares of pixel values, and pixel count. The original specification does not describe or suggest gathering statistics between textures.

C) The paragraph at page 16, lines 17-24, which describes that the system gathers statistics between color values. The originally filed specification does not describe the use of color values for performing statistically comparisons.

D) At page 23, lines 1-3, the substitute specification states that "it has been observed that textured triangle rasterization performed in a conventional graphics processor or the like closely resembles sparse matching of a template with an image." The originally filed specification did not describe such an equivalence between textured triangle rasterization and template matching.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

4. The following quotation of 37 CFR § 1.75(a) is the basis of objection:

> (a) The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

5. Claim 18 is objected to under 37 CFR § 1.75(a) as failing to particularly point out and distinctly claim the subject matter which the applicant regards as his invention or discovery.

Claim 18 recites the limitation "the compare processor" in line 4. There is insufficient antecedent basis for this limitation in the claim. The examiner suggests changing this limitation to read "the statistical compare processor".

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Sacks et al. (U.S. Patent No. 4,736,437 A).

As applied to claim 6, Sacks et al. discloses a method for comparing and matching a first set of digital data to at least a second set of digital data, comprising: loading at least one of the first and second sets of digital data into a first memory device (see Fig. 1: Digital data is loaded into reference memory 16.); using a 3D rendering device for rendering model transformations and accumulating statistics of the loaded digital data, said 3D graphics rendering device modified to include a statistical processor (see Fig. 3 and column 10, line 61 – column 11, line 13: The reference describes that the angle rotator initially rotates the scanning line of the information stored in the reference memory 16 (i.e. rendering model transformations). This information is then convolved

with the information in the video memory 20 and these values are accumulated by accumulator 24 (i.e. accumulating statistics). Convolver 22 is equivalent to the claimed statistical processor. (Note: The specification describes that a 3D rendering device is equivalent to a graphics rasterizer. Therefore, the overall system is a graphics rendering device.)); adjusting the model transformations based on the accumulated statistics (see Fig. 1: The accumulator 24, which accumulates the results from the convolver 22, sends information (i.e. accumulated statistics) to the CPU 10. The CPU 10 then uses this information to adjust the angle of rotation used by the rotator 18 to rotate the reference image (i.e. model transformation).); and statistically comparing and matching the model transformations of the loaded set of digital data to appropriately corresponding portions of the other set of digital data (see Fig. 1: The data is statistically compared and matched by the convolver 22).

As applied to claim 7, Sacks et al. discloses statistically comparing the sets of digital data until a match or non-match between the first and second sets of data is achieved (see column 8, lines 23-29: The reference describes accumulating information (i.e. statistically comparing) until the CPU 10 determines a best match (i.e. until a match or non-match between the first and second sets of data is achieved).).

As applied to claim 8, Sacks et al. discloses adjusting the models comprises analyzing the statistical comparisons and generating new transformations for matching the sets of data (see Fig. 1: The results of the convolution (i.e. computed statistics) are accumulated by accumulator 24 and then sent to CPU 10 where the results are analyzed. The CPU then sends information to rotator 18 so that different transformations can be performed on the reference image.).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sacks et al. (U.S. Patent No. 4,736,437 A), Segal et al. (the book titled "The OpenGL® Graphics System: A Specification (Version 1.2.1)"), and further in combination with well-known prior art.

As applied to claim 1, the applicant describes that the system can be embodied in a conventional computer graphics card that has been modified to include the statistical comparison processor (see applicant's specification: page 4, lines 26-27). Therefore, it is well known in the prior art to use a computer graphics card for raster transforming at least one of the first set of digital data and the second set of digital data and performing a pixel acceptance test using a pixel acceptance tester. However, it is not well known in the prior art to a) accumulate statistical information for each of the first set for digital data and the second set of digital data using a statistical processor and using the statistical information for statistically comparing and matching the raster transformed sets of digital data to appropriately corresponding portions of each other and b) to include the statistical processor in the computer graphics card.

Regarding difference b), Segal et al. discloses a graphics card with an included statistics processor (see page 234, section D.9.4: The reference describes a software

interface to graphics hardware that allows for the accumulation of statistical information regarding pixels (i.e. statistics processor).).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the well known graphics card by adding a statistics processor as taught in Segal et al. because the use of such a configuration would decrease the size and the cost of the system, thus increasing overall efficiency.

Regarding difference a), Sacks et al., in the same field of endeavor of image processing, discloses accumulate statistical information for each of the first set for digital data and the second set of digital data using a statistical processor and using the statistical information for statistically comparing and matching the raster transformed sets of digital data to appropriately corresponding portions of each other (see Figs. 1, 3, and column 10, line 61 – column 11, line 13: The reference describes that an angle rotator initially rotates the scanning line of the information stored in the reference memory 16 (i.e. raster transformed information). This information is then convolved with the information in the video memory 20 and these values are accumulated by accumulator 24 (i.e. accumulating statistics). This data is then statistically compared and matched by the convolver 22.).

As applied to claim 2, Sacks et al. discloses analyzing the statistical comparisons and generating new transformations for matching the sets of data (see Fig. 1: The statistical comparisons are analyzed by the CPU 10 and then new transformations are generated by the rotator 18.).

As applied to claim 3, Sacks et al. discloses statistically comparing the raster transformed sets of digital data until a match or non-match between the first and second sets of data is achieved (see column 8, lines 23-29: The reference describes accumulating

information (i.e. statistically comparing) until the CPU 10 determines a best match (i.e. until a match or non-match between the first and second sets of data is achieved).).

As applied to claim 4, Sacks et al. discloses raster transforming comprises raster transforming at least one of the first or the second set of digital data and computing statistics on the transformation (see Fig. 1: The raster transform in Sacks comprises rotating the reference image and then convolving it with the video image (i.e. computing statistics). This process is then repeated and the results of the convolution are accumulated by accumulator 24.).

As applied to claim 5, Sacks et al. discloses that statistically comparing and matching comprises analyzing the computed statistics of the transformation and calculating new and different transformations on the digital data (see Fig. 1: The results of the convolution (i.e. computed statistics) are accumulated by accumulator 24 and then sent to CPU 10 where the results are analyzed. The CPU then sends information to rotator 18 so that different transformations can be performed on the reference image.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the combination of the conventional graphics card and statistics processor taught by Segal et al. by adding the specific processing steps taught in Sacks et al. because the use of such processing steps allows the system to operate "with a minimal amount of memory" and to "implement all procedures in fast real time hardware" (see Sacks et al.: column 5, lines 27-29).

10. Claims 9-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Neff et al. (U.S. Patent No. 5,809,171 A), Segal et al. (the book titled

"The OpenGL® Graphics System: A Specification (Version 1.2.1)"), and further in combination with well-known prior art.

As applied to claim 9, the applicant describes that the system can be embodied in a conventional computer graphics card that has been modified to include the statistical comparison processor (see applicant's specification: page 4, lines 26-27). Therefore, it is well known in the prior art to use a computer graphics card including a raster transformer that transforms at least one of the templates.

As applied to claims 10-12, which call for the computer graphics card to include an address generator, the applicant has disclosed that such an address generator is conventional in the art (see applicant's specification: page 12, lines 4-6).

As applied to claim 13, which calls for the computer graphics card to include an acceptance tester, the applicant has disclosed that an acceptance tester is conventional in the art (see applicant's specification: page 15, lines 12-22).

As applied to claim 18, which calls for the use of pixel alpha values for weighting statistical information, the applicant has disclosed that such a weighting method is conventional in the art (see applicant's specification: page 22, lines 19-28).

Claim 9 also calls for elements that are not well known in the prior art including a) a statistics enable switch wherein accumulation of information for each digital template is enabled when said statistics enable switch is enabled, b) a statistical compare processor included in the computer graphics card, and c) accumulating information for each digital template and statistically comparing and matching images associated with the templates for tracking the templates based on the accumulated information.

Regarding difference b), Segal et al. discloses a graphics card with an included statistics processor (see page 234, section D.9.4: The reference describes a software interface to graphics hardware that allows for the accumulation of statistical information regarding pixels (i.e. statistics processor).).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the well known graphics card by adding a statistics processor as taught in Segal et al. because the use of such a configuration would decrease the size and the cost of the system, thus increasing overall efficiency.

Regarding difference a) Segal et al. discloses a graphic card with switches that enable or disable certain features (see Fig. 2.10: As can be seen in the figure, the device has switches for enabling certain features.).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the well known graphics card by adding an enabling switch as taught in Segal et al. because the use of such a switch will decrease processing time since information will only be accumulated when necessary.

Regarding difference c), Neff et al. discloses accumulating information for each digital template and statistically comparing and matching images associated with the templates for tracking the templates based on the accumulated information (see Fig. 1: Block 34 represents the correlation means and block 28 represents the comparison means. These devices are used to determine the correlation between the template and test image. The comparison means 28 also includes means for separately comparing each of the temporally distinct test images to the template (i.e. tracking).).

As applied to claim 14, as applied to claim 14, Neff et al. discloses that the color values are sent to a statistics/comparison device for statistical analyses and comparison processing (see column 11, lines 34-51: The color values are the gray level values of each of the labels (i.e. regions) of the template. These values are used by the correlation means and comparison means to determine the correlation.).

As applied to claim 15, Neff et al. discloses that the statistics/comparison device contains variables that are updated for each pixel based on the input color values of each pixel (see column 11, lines 23-33: The reference describes the use of N values that are used by the correlation and comparison means to determine the correlation (i.e. the statistics/comparison device contains variables that are updated for each pixel). These values are based on the gray level of a particular area (i.e. based on the input color values).).

As applied to claim 16, Neff et al. discloses that the statistical analyses compares and matches the template to the image by initially defining a function that estimates the similarity between the template and the image (see column 11, lines 34-51: The reference describes equation (1) that is used to determine the correlation X (i.e. defining a function that estimates the similarity between the template and the image).).

As applied to claim 17, Neff et al. discloses that the template is located in the image by computing the function at various locations in the image and determining where the function is maximized (see column 19, lines 10-20: The reference describes a system processor that determines the relative offset between the template image and the test image (i.e. the template is located in the image by computing the function at various

locations in the image) that provides the greatest correlation between the two images (i.e. determining where the function is maximized).).

As applied to claim 19, Neff et al. discloses raster processor renders the template at a plurality of offsets for allowing the raster processor to at least one of determining a desired position for the template and accumulate information to analytically compute a desired update (see Fig. 1, column 12, lines 66-67, and column 13, lines 1-3: The reference describes an offset means 36 for creating offsets between the template and test image (i.e. renders the template at a plurality of offsets) such that the template is compared to any number of different regions of the test image (i.e. allowing the raster processor to determine a desired position for the template).).

As applied to claim 20, Neff et al. discloses the offsets are fractional perturbations to vertices of the templates (see column 18, lines 20-39: The reference describes an offset means that allows pieces of the template to be compared to several different portions of the test image. Therefore, the offsets are fractional perturbations, since only a portion of the template moves across the image, of the vertices of the templates, since the edges of the template define the offsets).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the combination of the conventional graphics card and statistics processor taught by Segal et al. by adding the specific processing steps taught in Neff et al. because the use of such processing allows the system to "rapidly compare a test image to a template to determine the correlation X therebetween with little, if any, modeling or mensuration required" (see Neff et al.: column 7, lines 10-12).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan J. Miller whose telephone number is (703) 306-4142. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ryan J. Miller
Examiner
Art Unit 2621

Ryan J. Miller

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